Optical inactivity may also be due to mutual compensation between two asymmetric carbon atoms, of equal and opposite asymmetry, within the molecule itself. This is the case with inactive tartaric acid.

At the present moment there is no case known which contradicts the foregoing hypothesis. A few substances, which, at the time when the hypothesis was first put forward, were believed to be optically active, and yet contained in their molecule no asymmetric carbon atom, have since been shown to owe their supposed optical activity to impurities. On the other hand, the presence of an asymmetric carbon atom in the formula of an apparently inactive compound has been an indication to chemists that the resolution of the compound into two isomerides of opposite optical activity might be profitably attempted; and in the long list of such attempts that have been made within the last few years there appears to be no record of failure.

We have already alluded to M. Pasteur's classical researches on the tartaric acids, in which he not only rendered the Van 't Hoff-Le Bel hypothesis possible by elucidating all the various modes of optical activity and inactivity which it contemplates, but also devised the methods which have so facilitated its experimental development. It only remains to show how near this great investigator came to anticipating the entire hypothesis. In a passage written in 1860, quoted by Prof. Van 't Hoff, M. Pasteur says, referring to the tartaric acids:—

> " Les atomes de l'acide droit sont-ils groupés suivant les spires d'un hélice dextrorsum, ou *placés aux sommets d'un tétraèdre irrégulier*, ou disposés suivant tel ou tel assemblage dissymétrique déterminé ? Nous ne saurions répondre à ces questions. Mais ce qui ne peut être l'objet d'un doute, c'est qu'il y a groupement des atomes suivant un ordre dissymétrique à l'image non-superposable. Ce qui n'est pas moins certain, c'est que les atomes de l'acide gauche réalisent précisément le groupement dissymétrique inverse de celui-ci."

This is divination indeed !

We must content ourselves with merely referring to another portion of the subject—the application of the carbon tetrahedron to the explanation of anomalous cases of isomerism occurring among unsaturated compounds; of which *allo-isomerism*, as Prof. Michael has termed it, fumaric and maleic acids may be taken as illustrations. This application, first made by Van 't Hoff in 1874, and accepted later by Le Bel, has undergone within the past year an extension of extraordinary importance at the hands of Prof. Wislicenus in his elaborate memoir " Ueber die räumliche Anordnung der Atome in organischen Molekulen und ihre Bestimmung in geometrisch-isomeren ungesättigten Verbindungen " (*Abhandl. der Königl. Sächs. Gesellsch.*, 1887), of which a very full and appreciative summary is given by Prof. Van 't Hoff in the present work.

The tridimensional formulæ of organic chemistry are thus an accomplished fact. The treatment of the subject is still, of course, only statical; but, taking care not to lose sight of the limitations thus imposed, the method is a perfectly legitimate one.

F. R. JAPP.

THE MAMMOTH AND THE FLOOD.

The Mammoth and the Flood: an Attempt to Confront the Theory of Uniformity with the Facts of Recent Geology. By Henry H. Howorth, M.P., F.S.A. (London: Sampson Low and Co., 1887.)

MR. HOWORTH'S book is not disproportionate to its subject. But even as the mammoth it had a small beginning. It saw light as letters in NATURE. It cast its swaddling-clothes at the British Association. Grown larger, it took passage on board the *Geological Magazine*, and, as some thought, threatened to swamp that useful but far from bulky periodical. Now, with body and tusks alike full-grown, it comes forth to champion cataclysm and scatter the uniformitarians.

The book consists partly of facts, partly of theories. The one part is separable from the other, though of course sometimes the facts are regarded in the light of the theories. We will endeavour in our notice to keep them apart. The first chapter of the work a little reminds us of the *hors d'œuvre* which sometimes precedes a banquet. Appetizing bits, dainty but miscellaneous—the etymology of mammoth, and its identity with behemoth; griffons and their claws; fossil unicorns; dragons' bones; Indian fabulous beasts; stories of giants, and their bones: with such subjects is the reader's palate stimulated. The next chapter gives a history of opinion on the subject of the remains of the mammoth and the woolly rhinoceros. The author then discusses the abode and range of the mammoth in Asia. He considers it to have been limited to the tundras, which must at that time have enjoyed a climate far more temperate than at the present. Then comes an account of the various discoveries of carcasses, either of the mammoth or of the woolly rhinoceros, in Siberia; followed by the history of the same animals and their associates in Europe. The climate of Europe, when frequented by them, is next discussed, and the facts bearing on the extinction of the mammoth are enumerated, particular stress being laid on the evidence of caves and fissures. Palæolithic man is next called into the witness-box, and cross-questioned as to the cause of his disappearance. That he was exterminated by Neolithic invaders does not, to the author, seem a satisfactory theory. That he was a victim of the Deluge is a simple explanation. The Old World is now quitted for the New—the two Americas are examined. In each, at no distant time, huge mammals flourished; their remains are found under circumstances not materially different from those of similar quadrupeds in the Old World. So they also must have perished in like manner: the Deluge was not limited to Siberia nor to the Old World; it swept alike over tundra and morass, over prairie and pampa; it inundated the New. Of course the West Indies could not escape; apparently no corner of the earth eluded the devastating waves, for Australia, Tasmania, and New Zealand tell the like tale of extinguished life, and sudden devastation. Lastly, there is the citation of historical evidence, in the form of brief summaries of the many variations of the widespread tradition of a universal deluge.

The facts, as indicated by the above statement—which is only a concise summary of the table of contents—cannot wholly be disentangled from the theories, in the light of which they are viewed and in proof of which they are ranged. Still, their value is independent of the theories: for the author has dealt with them in the spirit of an advocate, but of an honest advocate. If, indeed, Mr. Howorth can be accused of any forensic art, it is in this very pardonable respect—that the most is made of the opinions of geologists who have held views generally favourable to his own. Thus the unwary and but slightly scientific reader almost trembles before such a weight of authority, and is afraid to question an opinion favoured by so many lights of the heroic age of geology. But in citing authorities it must always be remembered that, unless it can be shown that all the important facts on which an induction is now founded were before them also, the value of their opinion is greatly affected, and it may even be comparatively small. Further, if satisfied on this point, we must inquire whether any, and, if so, what, alternative hypotheses had been presented to them. These preliminary considerations are often overlooked in quoting authorities, yet their importance cannot be disputed. The mind is greatly influenced by early impressions and by the hypotheses which it has accepted. In the multitude of facts we to some extent find what we seek, miss those of whose value we are ignorant, and without any conscious unfairness select those things which support the accepted view. Anyone who has had in the course of his life to reconsider and to modify an induction formerly maintained must be conscious that in this respect he has innocently erred. Probably, only a cantankerous-minded investigator wholly escapes this infirmity, and for him other snares are laid. Hence in this matter the testimony of even such men as Buckland, or Cuvier, or D'Archiac, is of small value, because not only has a vast store of new facts been acquired since their time, which have influenced or modified almost every branch of geology, but also because the widespread belief in a universal deluge and the virulent attacks made on geology by well-meaning but unthinking theologians had produced a natural readiness to welcome everything which seemed to harmonize with the Biblical narrative.

Mr. Howorth urges that a catastrophic occurrence is not excluded by a rational view of uniformitarianism—which position, we imagine, few would dispute in the abstract; but issue would often be joined as to which explanation were the more probable. He points out also that it is quite possible for a particular form of a tradition to be unhistorical, and yet for the tradition itself to have a true foundation, a remark which is certainly just, and which is sometimes forgotten. But, admitting these axioms, the asserted occurrence of any particular cataclysm is a question of evidence; and it is not enough for Mr. Howorth to show that his hypothesis explains some difficulties which exist in the other, unless he further prove that it is not only in accordance with a larger number of facts, but also does not create a new class of difficulties still more formidable.

Mr. Howorth's preface sounds no uncertain note, as the following extract will show:—

> "The coral-insect (*sic*) raises the islands of the Pacific, and the fall of leaves in a tropical forest piles up deep black soil. These cases are no doubt cases of continuous change; but if we turn elsewhere we have to explain a very different state of things. The great gaping cliffs and sheer precipices of the Alps, the splintered pyramids of the Sierra Nevada, the cañons of Colorado, the huge dislocations of the strata, involving faults of hundreds of fathoms in extent, so near us as Durham. These have not the look of gradual changes."

We rub our eyes, and wonder whether the last fifty years have been all a dream. Here are dead and gone geological ideas in full vigour. We had thought that if there was one spot on earth in which catastrophe could not be invoked, where the uniformitarian could be in peace, it was the Colorado cañons; and we cannot help thinking that if Mr. Howorth were a member of the English Alpine Club he would by this time have convinced himself that, whatever signs of ruin the Alps may afford, there are none of any vast catastrophe. It is therefore evident that Mr. Howorth's method of interpretation differs from that of geologists in general, and this must throughout the book be borne in mind by the reader. But Mr. Howorth is always rather a special pleader, ingenious sometimes, but generally inconclusive. Granting that occasionally he contrives to give a smart rap to the irrational uniformitarian (for such a person does exist) and hits upon a defect in an hypothesis, he straightway goes on to propose a solution involving greater difficulties. In a brief notice it is impossible to deal with particular instances, but some general indications may be given The carcasses of mammoths are found embedded in ice in the north of Siberia. It is admitted that, from their state of preservation, they must have been frozen up very shortly after death, and have so remained ever since. There are no doubt considerable difficulties in attributing their transport to a river flood, as Mr. Howorth points out; nevertheless, when we remember the peculiarities of the Siberian rivers, and that in a cold region a carcass would be slow to decompose, for the flesh might freeze before it ceased to drift, these do not seem insuperable. Mr. Howorth, as an alternative, offers the hypothesis of a deluge, followed by a sudden change of temperature, but, apart from the difficulties attending the former part of this, by what physical or astronomical catastrophe does he account for the latter? Wisely, he makes no attempt to indicate this.

Again, in speaking of the contents of caves, Mr. Howorth constantly lays stress upon the indications of the action of running waters, and upon the absence of any such disturbing agent at the present time. But he forgets that even followers of Lyell would admit that at no very remote epoch the climate of England was different, the rainfall was heavier, the streams were all bigger, nay, that a cave itself is symptomatic of running water, which in most cases would gradually forsake its old course. The stream which made Clapham Cave still runs concealed, hard at hand, through the limestone rock, and not so long ago, after a downpour on Ingleborough, welled up into its ancient channel. We wonder whether Mr. Howorth has ever seen what the fall of 4 inches of rain in a single night—no unprecedented case—can do even in our English lowlands. Such a downfall would turn many a dry fissure, small as its drainage-area might be, into a running stream. Mr. Howorth, in combating uniformitarians, seems to overlook the variations and catastrophes on a small scale (compared with the bulk of the earth) which everyone who has sat at the feet of Lyell accepts as axiomatic.

It would have been more politic had Mr. Howorth contented himself with local deluges; but no, his destroying waves must pass over the whole earth. What is to generate these destructive waves, what multiplication of a Krakataõ catastrophe is needed, how many cubic miles of mountain summit must fall into the sea, or of ocean bed leap up into the air, he forbears to tell us. Here, after a laborious scrutiny of facts, the reader is refreshed by a use of the imagination.

We leave a host of minor difficulties unnoticed for want of space, such as the occurrence of erratic blocks in positions of unstable equilibrium, the relation of drifts, supposed cataclysmal by the author, to the valleys in which they occur, the escape of apterous birds like the moa and the dodo, and the like. We must part from the book by saying that it exhibits great industry in the collection of materials—so that it will long be valuable as a work of reference—with a curious want of mental perspective, and a misapplied ingenuity of reasoning.

NEW ZEALAND SCALE INSECTS.

An Account of New Zealand Scale Insects. By W. M. Maskell, F.R.M.S. (Wellington: Geo. Didsbury, 1887.)

THIS book shows that the valuable work which is being done in South Australia by Mr. Frazer Crawford, Inspector under the Vine-Protection Act, is being done on a still greater scale in New Zealand. It affords an example of the great service which may be rendered by plain and sound publications on the subject of injurious insect attacks in the colonies. In the mother country the works which have been prepared for the Agricultural Department of the Privy Council by Mr. Whitehead, and Miss E. A. Ormerod's constant valuable publications on economic entomology, show what can be achieved in this field.

It is eminently satisfactory to find such an important subject taken up in New Zealand by an observer so well known as Mr. Maskell. The work extends to 116 pages, and includes exhaustive information on the Coccididæ affecting the crops of the island. The life-history of the Coccididæ (which are divided by the author as follows: I. Diaspidinæ; II. Lecanidinæ; III. Hemicoccidinæ; IV. Coccidinæ) is given in all its stages, a whole chapter being devoted to it, with descriptions of the male and female perfect insects in detail, and another to the natural checks to their increase, and parasites, &c.

The remedies against Coccididæ are fully treated of in Chapter V. The author gives a list of washes, of which he says: "Some of the substances here given are manifestly unsuitable for general use on account of their expense, at any rate in the open air; yet it is well to include them, as they are all suggested in some work or other, or in the replies of gardeners and fruit-growers to Parliamentary inquiries, and the objections to them ought to be known."

Chapter VI. is devoted to "A Catalogue of Insects"—that is, of the Coccididæ—and "A Diagnosis of Species," and will be found to be of great service to all students of entomology. Particular attention is paid to the cottony-cushion scale, the *Icerya purchasi*, whose ravages in South Africa have been so ably treated of in the pamphlet lately published by the Consulting Entomologist of the Royal Agricultural Society of England, also by the State Inspector of the Fruit Pests of California, and more recently by Prof. Riley, the well-known Entomologist of the Department of Agriculture of the United States. "Tree-growers should especially beware of this insect, and the best plan to adopt would be to burn at once any tree found infested with it."

This chapter, which occupies almost two-thirds of the book, is succeeded by an index of plants and the Coccididæ attacking them, with the useful reminder that in hot-houses and green-houses all sorts of plants are liable to attack.

The work also contains twenty-three well-drawn plates, which convey a good idea of the Coccididæ to those who have not the opportunity of studying them. Plates I., II., and III. deal with anatomical points or structural details; Plates IV. to XX. give a large selection of insects, with specimens of the various trees and plants they infest; Plate XXI. is especially valuable as giving the male insects *Cœlostoma zœlandicum* and *C. wairoense*, the antenna of the former and the head of the latter being especially well marked. Plate XXII. gives the honey-dew and resulting fungi, and Plate XXIII. parasites of Coccididæ. "Fig. 1, *a*, pupa of Hymenopterous parasites; *b*, the same pupa under the waxy test of *Ctenochiton perforatus*; *c*, imago. Fig. 2, *a*, brown and yellow fungi on *Ctenochiton viridis*; *b*, upper side of brown fungus; *c*, under side of the same, with attached fungoid sheet; *d*, *Ctenochiton viridis* (test removed), filled with yellow fungus, and with globular mass of the same above it."

From the above brief sketch of the contents of Mr. Maskell's book it will be seen that it is a welcome addition to entomological literature. It is written in plain and forcible language, and there is no padding or beating about the bush for the reviewer to find fault with. There is an excellent tabulated explanation of terms used, and students will be much pleased with the author's classification, or rather division or arrangement, of the Coccididæ, based upon a plan most useful for economic entomology:—

> "Neglecting entomological distinctions, we may divide the Coccididæ roughly into
>
> "(*a*) Insects attacking deciduous plants;
> "(*b*) Insects attacking evergreen plants;
>
> or again:
>
> "(*c*) Insects living usually on the bark;
> "(*d*) Insects living usually on the leaves;
> "(*e*) Insects living on both bark and leaves;
>
> or lastly:
>
> "(*f*) Insects covered with hard shields or 'scales';
> "(*g*) Insects covered with cotton;
> "(*h*) Insects naked."

Among other salient points the importance of destroying the eggs is frequently urged upon those who wish to extirpate coccids, and attention is wisely drawn to the fact that "it is a fallacy to imagine that rule-of-thumb methods, not founded upon any knowledge of the nature, habits, and life-history of the insects, are likely to be really efficacious."

We agree with the author that an increase in works on